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General dynamical properties of cosmological models with nonminimal kinetic coupling

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Abstract

© 2018 IOP Publishing Ltd and Sissa Medialab. We consider cosmological dynamics in the theory of gravity with the scalar field possessing the nonminimal kinetic coupling to curvature given as η Gμνφ,μφ,ν, where η is an arbitrary coupling parameter, and the scalar potential V(φ) which assumed to be as general as possible. With an appropriate dimensionless parametrization we represent the field equations as an autonomous dynamical system which contains ultimately only one arbitrary function χ (x)= 8 π η V(x/8 π) with x=8 πφ. Then, assuming the rather general properties of χ(x), we analyze stationary points and their stability, as well as all possible asymptotical regimes of the dynamical system. It has been shown that for a broad class of χ(x) there exist attractors representing three accelerated regimes of the Universe evolution, including de Sitter expansion (or late-time inflation), the Little Rip scenario, and the Big Rip scenario. As the specific examples, we consider a power-law potential V(φ)=M4(φ/φ0)σ, Higgs-like potential V(φ)=λ/4(φ2-φ02)2, and exponential potential V(φ)=M4 e-φ/φ0.

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Keywords

dark energy theory, inflation, modified gravity

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